DOCUMENT RESUME

ED 292 403 HE 021 267

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TITLE Reciprocal Causation and Mixed Effects within the Tinto Model of College Student Withdrawal. ASHE Annual Meeting Paper.
PUB DATE Nov 87
NOTE 34p.; Paper presented at the Annual Meeting of the Association for the Study of Higher Education (Baltimore, MD, November 21-24, 1987).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Academic Persistence; *College Students; *Dropout Research; Ethnic Groups; Females; Higher Education; Males; Minority Groups; Models; Student Adjustment; Student Attitudes; *Student Attrition; *Student College Relationship
IDENTIFIERS *ASHE Annual Meeting; *Tinto Model

ABSTRACT

Relationships between constructs in the Tinto model of college student withdrawal were explored. Within the Tinto model, LISREL was used to examine: (1) the influence of academic integration on social integration and vice versa; and (2) the effect of goal commitment on institutional commitment and vice versa. Survey data were collected at a major public university at the beginning of and 10 weeks into the fall 1984 semester and at the beginning of the 1985 spring semester. A total of 323 students were administered the Motivational Orientation Scale and the Institutional Integration Scales and data were collected on student grade point average, hours earned, and registration status the following semester. Consideration was given to five key constructs of Tinto's model that are linked causally to persistence: background characteristics, initial commitments, academic integration, social integration, and later commitments. It was found that the more academically integrated a student, the more likely he/she was to be socially well integrated. Majority students were more likely to have higher academic integration scores. Patterns for males and females were also assessed. Eighteen references are included. (SW)

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Reciprocal Causation and Mixed Effects Within the Tinto Model of College Student Withdrawal

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This paper was presented at the annual meeting of the Association for the Study of Higher Education held at the Sheraton Inner Harbor Hotel in Baltimore, Maryland, November 21-24, 1987. This paper was reviewed by ASHE and was judged to be of high quality and of interest to others concerned with the research of higher education. It has therefore been selected to be included in the ERIC collection of ASHE conference papers.

Reciprocal Causation and Mixed Effects Within the Tinto Model of College Student Withdrawal

The presentation of the Tinto model of college student attrition (1975) marked the pivotal point in the study of persistence. Drawing directly from Spady (1970, 1971), Tinto explicated a conceptual schema of college withdrawal which distinguished between the academic and the social dimensions of the college environment. Prior to the presentation of the model, research had been unintegrated. Researchers explored myriad individual variables in relation to persistence but did little to tie them together conceptually. The Tinto model provided structure which was used to begin to place these variables in relationship to one another in both sequence and importance.

Additionally, the Tinto model directed researchers toward new methodological techniques necessary for further advancement in understanding the persistence phenomenon. The typically used correlation and multiple regression techniques were not adequate to the task of describing relationships within the model. Tinto suggested the use of longitudinal data collection and path analysis techniques to specify order and causality among the variables.

Along these two dimensions then, conceptual and methodological, persistence study changed abruptly. And Tinto has influenced directly nearly every study since 1975 including other major persistence models (Bean, 1980, 1985).

Recent research based upon Spady's (1970, 1971) and Tinto's (1975) longitudinal process models of attrition has explored links among the background characteristics of students, the social and academic integration of those students within the college and university system, and ultimately their persistence or withdrawal.

The Tinto model as initially described separates the main constructs into two realms, the social and the academic (Tinto, 1975). Recent research based upon this longitudinal process model of attrition has explored links among the background characteristics of students, the social and academic integration of those students within the college or university system, and ultimately their persistence or withdrawal. Empirical tests of relationships within the model using path analysis demonstrated a mixing of the influences between these academic and social realms (Pascarella & Chapman, 1983; Pascarella & Terenzini, 1983). For example, initial goal commitment influenced not only academic integration, as specified in theory, but also was significantly related to aspects of the social realm such as social integration (Pascarella & Chapman, 1983).

Additionally, researchers working within the Tinto framework have consistently found what has been termed a compensatory relationship among variables (Pascarella and Terenzini, 1983; Pascarella and Chapman, 1983; Terenzini and Pascarella, 1980). That is, academic integration has its strongest positive influence on persistence at relatively low levels of social

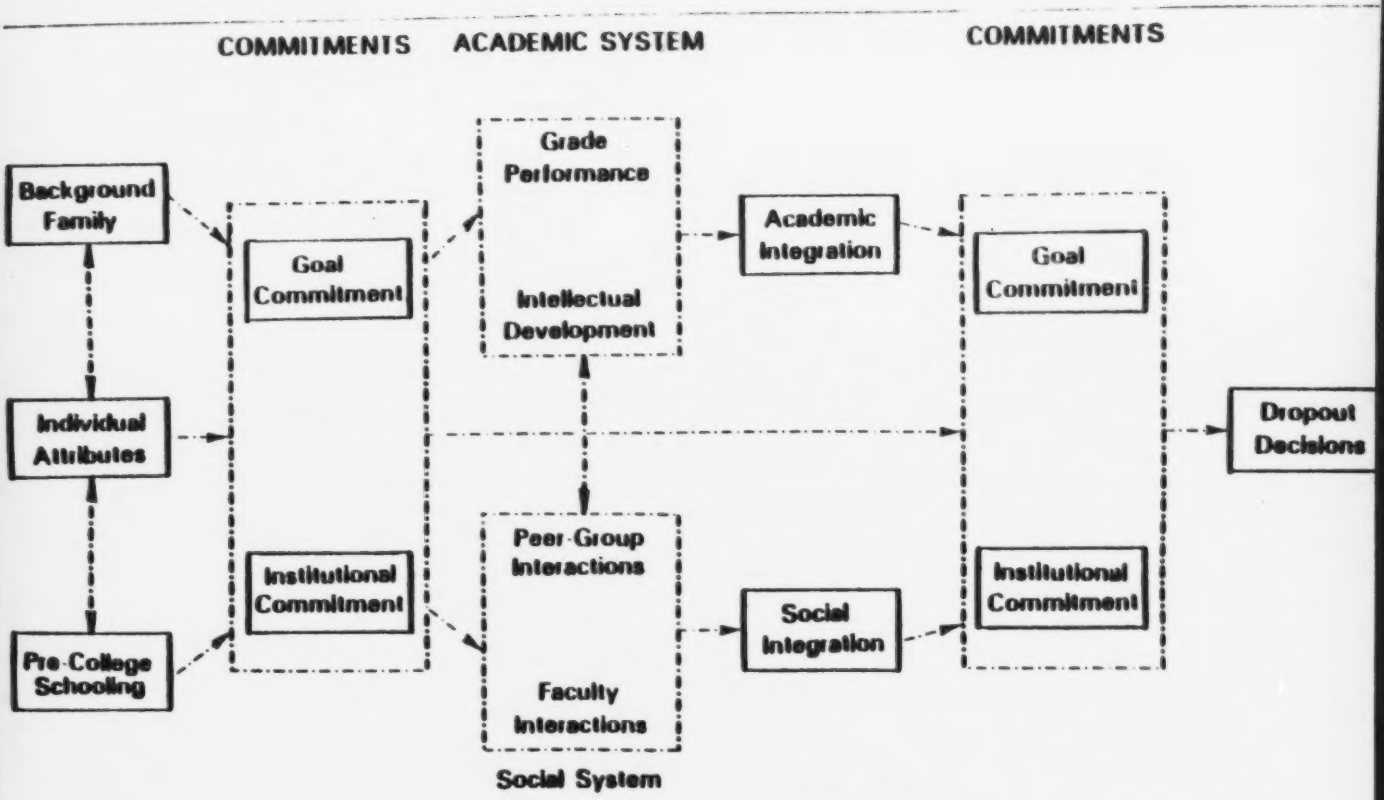

Figure 1. A conceptual schema for dropout from college. (From "Dropout from higher education: A theoretical synthesis." by V. Tinto, Review of Educational Research, 1975, 45, 89-125.)

integration. As the level of social integration increases, the positive influence of academic integration on persistence becomes less pronounced. The same compensatory relationship is true for the influence of social integration. Similar relationships exist between commitment to the goal of graduation and commitment to the institution.

Frequently researchers have speculated that relationships within the Tinto model may be reciprocal (Pascarella & Terenzini, 1983; Tinto, 1975, 1982, 1987). However, with path analysis and other forms of regression analysis (typically employed in persistence research), specification of reciprocal relationships among variables is impossible. With the use of LISREL such reciprocal relationships in the model may be examined. Additionally, using LISREL hypothesis tests may be conducted to determine whether the addition of paths which mix effects across social and academic realms significantly contribute to the fit of the model to the data being analyzed.

The purpose of this study was to examine effects across the academic and social dimensions of college student withdrawal. Additionally, reciprocal causation between academic integration and social integration and between later goal commitment and later institutional commitment were examined.

Research questions included the following:

1. Within the Tinto model does academic integration significantly influence social integration and vice versa?

2. Within the Tinto model does later goal commitment significantly influence later institutional commitment and vice versa?
3. Does the Tinto model as originally specified, without the addition of paths crossing the academic and social realms, adequately explain the persistence process for students at the university under study?

LISREL was used to analyze relationships among constructs within the Tinto model. Because the distribution of the final criterion, persistence, was highly skewed (91% persisters, 9% dropout) regression and LISREL techniques are inappropriate. For this reason LISREL was used to analyze the model only through the later commitment variables.

The Tinto Model

Tinto viewed the attrition process as a series of changing commitments and experiences affecting students' integration and, ultimately, decisions to withdraw from or to continue in the institution. The underlying assumption of the model was that students enter an institution with certain specifiable background characteristics and a measurable level of initial commitments. Within the institution, students engage in interactions with the environment during which they become integrated into the system both academically and socially.

In addition to these clearly distinguished realms of activity, academic and social, the model incorporated such

factors as family background, individual attributes and pre-college schooling. The individual's commitments to goals were included in the model to help specify the psychological orientations the individual brought to the college setting. Interactions between individuals and the academic and social systems of their college continually acted to modify goals and institutional commitments in ways which led to persistence or to varying forms of dropout. Theoretically, for two students of similar backgrounds and the same levels of initial commitments, a higher degree of integration into the system for one would mean greater subsequent commitment to the institution and to the goal of college completion.

Method

Design and Sample

The study was conducted at a major public university in the southwest. The study design was longitudinal with survey data collected at the beginning of and ten weeks into the fall semester of 1984 and at the beginning of the spring semester of 1985. The typical fall to spring semester attrition rate at the focal institution varied from 10-12 percent. These rates are similar to the freshman to sophomore year attrition rates of other persistence research [Bean (1985), 10.0%; Pascarella and Terenzini (1980), 6.2%; Pascarella and Terenzini (1983) 11.64%]. The rate in this semester to semester study (9%) provided a similar amount of variance in the sample.

The Tinto model as originally specified provides for continual modification of commitments based on interaction with social and academic aspects of an institution. Such modification can and does occur at anytime during the four years of matriculation. Hence, some students drop out after less than a week in college, others drop out in their final year. It was determined that a semester to semester study might shed some light on attrition problems at this particular institution.

All non-transfer students at the university were required to take Freshman Composition, Advanced Freshman Composition or to "test out" of Freshman Composition. A random sample was taken of English composition classes at the university. In order to sample students as soon as possible in the fall semester, surveys were distributed in the selected sections during the first two weeks of classes. Additionally, a random sample was taken of a small group of students who had "tested out" of Freshman Composition. These students were surveyed by mail.

The first survey elicited responses to the motivational orientation scale (EPS), institutional and goal commitment scales, and demographic information. In approximately ten weeks students were surveyed again using the Institutional Integration Scales (Pascarella and Terenzini, 1983). Finally, responses were matched with institutional records to determine GPA achieved, hours earned and registration for the following semester. Seventy-one point two percent (n=319) of the students in the classrooms and fifty-seven point three percent (n=4) of the seven

students surveyed by mail completed both surveys and were successfully matched to the institutional data base for an overall response rate of seventy-one percent (n=323).

Variables

The Tinto model consists of five key constructs linked causally to persistence: background characteristics, initial commitments, academic integration, social integration, and later commitments.

Background characteristics. This construct was operationalized through responses to initial survey received early in the fall semester. Students were asked age, gender, ethnicity, mother's education level and father's education level (See Table 1).

Initial commitments. Measures of initial goal and institutional commitments were taken in the first survey using the Institutional Integration Scales (IIS) (Pascarella & Terenzini, 1983) (See Table 1).

Academic Integration. This construct, measured with the second survey instrument (two months into the semester), was designed to quantify academic experiences on campus. There were five indicator items:

1) the Academic Development Scale [IIS, reported alpha reliability, .72 (Pascarella & Terenzini, 1983)]
2) the Faculty Concern Scale (IIS, reported a=.77)
3) grade point average (GPA)

TABLE 1

Measurement of Variables

Background Characteristics:

Mother's Education:
1 = < 12 years
2 = high school graduate
3 = 2 years college
4 = Bachelors degree
5 = Graduate or Professional School

Father's Education:
1 = < 12 years
2 = high school graduate
3 = 2 years college
4 = Bachelors degree
5 = Graduate or Professional School

Age

Sex:
1 = Female
2 = Male

Ethnicity:
0 = American Indian, Black, Chicano
1 = Anglo, Asian,Other

Goal Commitment (Time 1):
mean score on 3 items such as
It is important for me to graduate from college.
I have no idea at all what I want to major in.

Institutional Commitment (Time 1):
mean score on 5 items such as
It is important for me to be enrolled at this University.
It is likely that I will register at this University next fall.

Academic Integration:
Academic Development - mean score on 7 items such as -
I am satisfied with the extent of my intellectual development since enrolling in this university.
My academic experience has had a positive influence on my intellectual growth and interest in ideas.

Faculty Concern - mean score on 5 items such as -
Few of the faculty members I have had contact with are generally interested in students.
Few of the faculty members I have had are genuinely outstanding or superior teachers.

Table 1 (continued)

Academic Integration (continued)

GPA
Hours earned
Hours spent engaged in academic activities (band, theatre, publications, professional clubs, etc.)

Social Integration:
Peer Group Relations - mean score on 7 items such as -
Since coming to this university I have developed close personal relationships with other students.
The student friendships I have developed at this university have been personally satisfying.

Informal Faculty Relations - mean score on 5 items such as -
My nonclassroom interactions with faculty have had a positive influence on my personal growth, values and attitudes.
My nonclassroom interactions with faculty have had a positive influence on my career goals and aspirations.

Residency: 1 = off campus
2 = off campus with other students
3 = on campus

Campus Employment: 1 = yes
2 = no

Hours spent engaged in social activities (intramurals, sororities, fraternities, social clubs, residence hall activities, etc.)
Hours spent engaged in intercollegiate athletics

Institutional Commitment (Time 2): same measures as shown on previous page
Goal Commitment (Time 2): same measures as shown on previous page

4) credits earned during the first semester

5) hours spent engaged in academic extra-curricular activities such as band, theatre, professional organizations, etc. (See Table 1).

Social Integration. This construct, also measured with the second survey instrument, was composed of six items:

1) the Peer Group Relations Scale (IIS, reported a=.84)

2) the Informal Faculty Relations Scale (IIS, reported a=.83)

3) residency

4) campus employment

5) hours spent engaged in social activities

6) hours spent engaged in intercollegiate athletics (See Table 1).

Later Commitments. Repeated measures of institutional and goal commitments were taken with the second survey.

Persistence. Whether or not registered for the spring semester.

Statistical Analysis of the Model

Causal relationships among the constructs within the Tinto model were examined using LISREL. Upon application of LISREL to any given set of data, theoretically motivated constraints may be placed upon specific portions of the model to test hypotheses regarding relationships among variables in a model or relationships between models for different subgroups. By

paths added because of previous research results — r

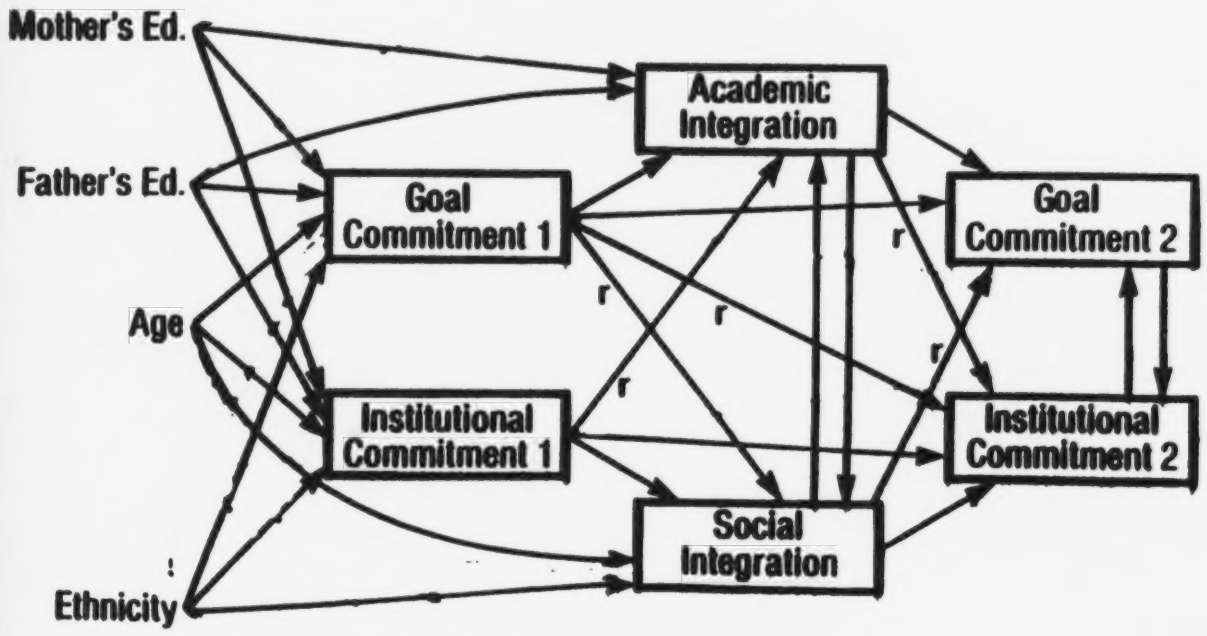

Figure 2 The model

constraining factors (restricting them to certain values) and then comparing the chi-square for the unconstrained model one can determine the statistical significance resulting from the constraint (Benin & Johnson, 1984; Wolfle, 1985).

The resulting LISREL model may be evaluated using the chi-square statistic with its associated degrees of freedom and probability level, the goodness-of-fit index and the root mean square residual. The chi-square is an evaluation of fit of the given data to the resulting model. A high ratio of chi-square to degrees of freedom (larger than three) indicates a poor fit. The statistic is affected by sample size, however, and for very large sample sizes a model may be rejected even when it fits the data well.

Within LISREL, an initial model was specified using paths described in Tinto's model. The models for the two subgroups were run simultaneously. A series of hypotheses were posed regarding causal relationships within the models. Reciprocal causation between academic and social integration, reciprocal causation between later institutional and later goal commitment, and extraneous paths were all examined for the model. The tests were conducted by comparing the chi-square statistic of a given model with the chi-square statistic of a slightly altered model. In this way a statistical test determined whether a particular path actually made a significant contribution to the fit of the model to the data (Wolfle, 1985). Models were retained only if they significantly improved the fit.

Testing for Reciprocal Causation

The first part of the analysis focused on exploring reciprocal causation within the Tinto model. Table 2 shows the results of these tests. The first model was run as originally specified by Tinto. Correlations between Goal Commitment 1 and Institutional Commitment 1, between Goal Commitment 2 and Institutional Commitment 2 and between GPA and Hours Earned were specified. This model resulted in a chi-square of 455.28 with 272 degrees of freedom (df). To determine whether a path from Academic Integration to Social Integration significantly improved the fit of the model to the data, that path was freed and the model rerun. This first modification to the model (model 2) resulted in a chi-square of 408.42 with 270 df, an improvement in chi-square of 46.86 for two degrees of freedom, significant at the .001 level. This path was retained for the remainder of the analysis. Next, the path from Social Integration to Academic Integration was freed (model 3). This model resulted in a chi-square improvement of 6.38 for two degrees of freedom ($p < .05$). This path was also retained. The addition of the reciprocal causation paths between Academic and Social Integration resulted in significant improvement to the model.

In the next model (4) the path from Goal Commitment 2 to Institutional Commitment 2 was freed. This change in the model resulted in a larger chi-square, a decrease in the goodness of fit of the model to the data. Therefore this additional path was not retained. The opposite path, from Institutional Commitment 2

Table 2

Hypothesis Testing for Reciprocal Causation

Model	Description	df	x^2	Δdf	Δx^2	sig.
1.	The original model	272	455.28	-	-	-
2.	Same as 1 with AcadInt to SoclInt free-compared to 1.	270	408.42	2	46.86	$p<.001$
3.	Same as 2 with SoclInt to AcadInt free-compared to 2.	268	402.04	2	6.38	$p<.05$
4.	Same as 3 with GoalCom2 to InstCom2 free-compared to 3.	268*	420.64	-	poorer fit	
5.	Same as 3 with InstCom2 to GoalCom2 free-compared to 3.	266	400.20	2	1.84	n.s.

* Correlation between Goal Commitment 2 and Institutional Commitment 2 was fixed to zero when the path was freed. Thus the df remained the same as in model 3.

to Goal Commitment 2 was freed next. This resulted in an improvement in chi-square of only 1.84 for 2 df, an insignificant change in the fit of the model to the data. This path was not retained. The addition of reciprocal causation paths between Institutional Commitment 2 and Goal Commitment 2 did nothing to improve the fit of the model to these data.

Testing Extraneous Paths

The second part of the analysis focused on testing extraneous paths. These causal paths cross between the separate academic and social realms of the Tinto model. They had been added to the model in efforts to improve explained variance by persistence researchers using path analysis . The next model (6) tested was the same as model 3 (the best model from the previous analysis) with the path between Goal Commitment 1 and Social Integration freed. The model failed to reach convergence indicating a poor fit of the model to the data. The next model (7) tested was the same as model 3 with the causal path from Institutional Commitment 1 to Academic Integration freed. Again the model failed to reach convergence.

The test of model 8, the same as model 3 with the path from Goal Commitment 1 to Institutional Commitment 2 freed, resulted in an improved chi-square of 6.10 for 2 df ($p < .05$). This model was retained. Model 9 was the same as model 8 wth the path from Academic Integration to Institutional Commitment 2 freed. This resulted in an increase in chi-square, a poorer fit of the model to the data. This path was dropped.

Table 3

Hypothesis Testing for Extraneous Paths

Model	Description	df	x^2	df	x^2	sig.
6.	Same as 3 with GoalCom1 to SoclInt free-compared to 3.			no convergence		
7.	Same as 3 with InstCom1 to AcadInt free-compared to 3.			no convergence		
8.	Same as 3 with GoalCom1 to InstCom2 free-compared to 3.	266	395.94	2	6.10	$p<.05$
9.	Same as 8 with AcadInt to InstCom2 free-compared to 8.	264	397.01	-	poorer fit	
10.	Same as 8 with SoclInt to GoalCom2 free-compared to 8.			no convergence		

Table 4

Standardized Path Coefficients - Male Subgroup (n=128)

Independent Variable	Goal Commit1	Instit. Commit1	Acad. Integ.	Social Integ.	Goal Commit2	Instit. Commit2
Mother's Ed.	.044	-.031	-.003	0	0	0
Father's Ed.	-.036	.028	.020	0	0	0
Age	.057	.008	0	-.001	0	0
Ethnicity	.000	-.007	.348*	-.291**	0	0
Goal Commit 1	0	0	-.009	0	-.057	-.144
Inst Commit 1	0	0	0	.012	0	.148***
Acad Integ	0	0	0	.799**	.139*	0
Socl Integ	0	0	1.179*	0	0	.169*

* $p<.05$ ** $p<.01$ *** $p<.001$

Finally, model 8 with the path from Social Integration to Goal Commitment 2 was freed (model 10). The model failed to reach convergence indicating a poor fit of the model to the data.

Results

Standardized path coefficients and their significances by subgroup are presented in tables 4 and 5. For males Ethnicity (positive for majority students) and Social Integration were both significant predictors of Academic Integration. In turn, Ethnicity (positive for non-majority students) and Academic Integration were significant predictors ($p < .01$) of Social Integration. Academic Integration was a significant predictor of Goal Commitment 2. And, both Institutional Commitment 1 and Social Integration were significant predictors of Institutional Commitment 2.

For females, both Ethnicity (positive for majority students) and and Social Integration were positive predictors of Academic Integration. Ethnicity (again, positive for majority students) and Institutional Commitment 1 were significant predictors of Social Integration. Institutional Commitment 2 was predicted by level of Institutional Commitment 1. And, Goal Commitment 2 was negatively predicted by Academic Integration.

Discussion

Researchers have speculated that relationships between constructs in the Tinto model may be reciprocal (Pascarella &

Table 5

Standardized Path Coefficients - Female Subgroups (n=185)

Independent Variable	Goal Commit1	Instit. Commit1	Acad. Integ.	Social Integ.	Goal Commit2	Instit. Commit2
Mother's Ed.	.028	.120	-.069	0	0	0
Father's Ed.	.122	.032	-.043	0	0	0
Age	-.001	.140*	0	-.132	0	0
Ethnicity	.057	-.090	.195*	.202*	0	0
Goal Commit 1	0	0	.094	0	-.020	-.134
Inst Commit 1	0	0	0	.580***	0	.257***
Acad Integ	0	0	0	-.076	-.073*	0
Socl Integ	0	0	.530***	0	0	.029

* $p<.05$ ** $p<.01$ *** $p<.001$

* p< .05
** p< .01
*** p< .001

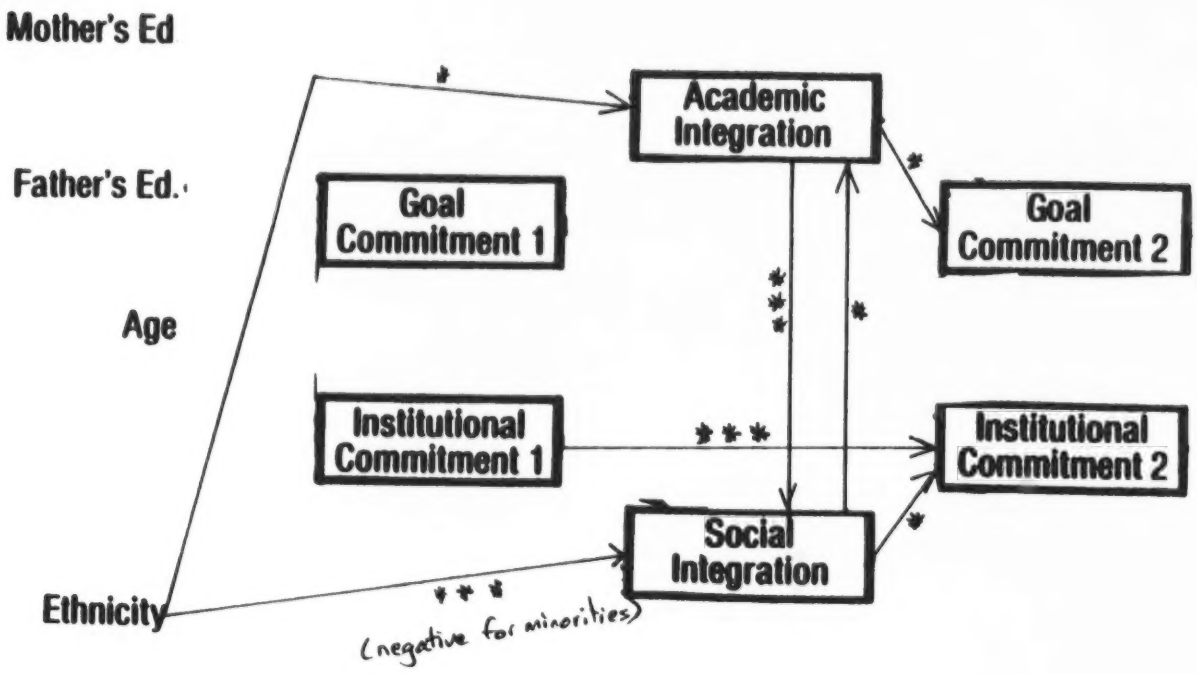

Figure 3. The final model for the male subgroup

* p<.05
** P<.01
*** p<.001

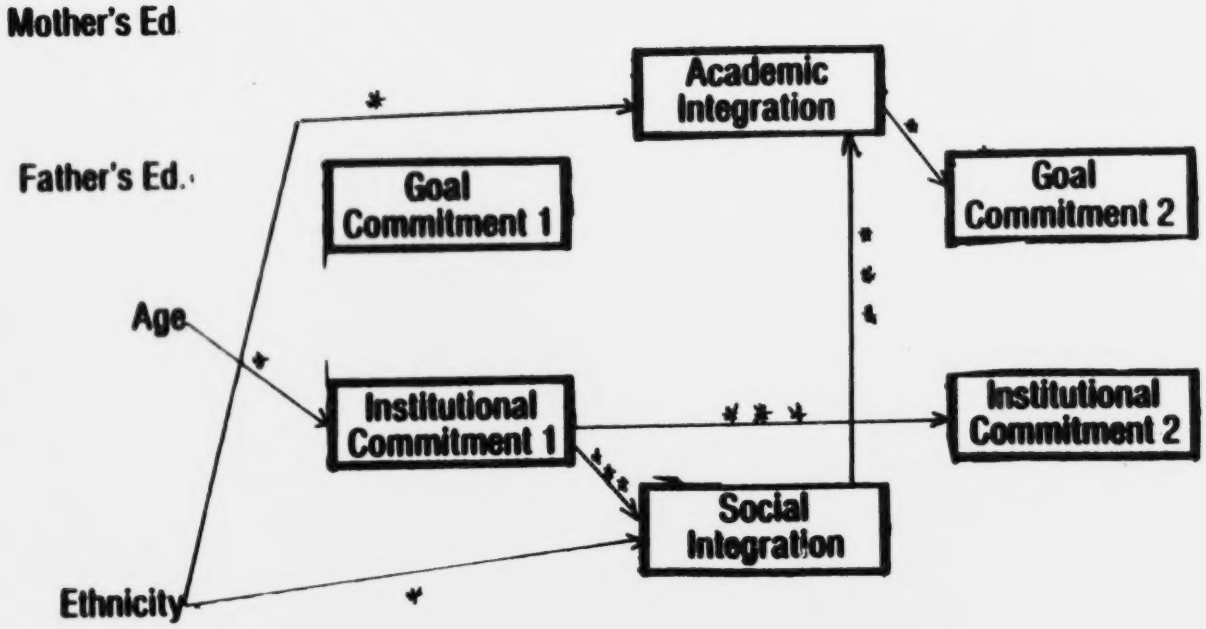

Figure 4. The final model for the female subgroup

Terenzini, 1983; Tinto, 1975, 1982). With statistical tools used to analyze data in most persistence studies, once the researcher has specified order, causality and direction among variables in question, reciprocal relationships cannot be explored. Techniques employed in most studies assume a recursive or unidirectional model of causal relationships. It may be some that causal linkages in the Tinto model are reciprocal rather than unidirectional.

As specified within LISREL, the model allowed exploration of previously untested reciprocal causation. The effect of academic integration on social integration was significant and positive for both males and females. In other words, the more academically integrated a student was, the more likely he or she was to be socially well-integrated. Additionally, for males the effect of social integration on academic integration was both significant and positive. For females however, the same effect was negative, but not significantly different from zero. For males only, greater levels of social integration also led to greater levels of acdemic integration. For females however, social integration did not enhance, and in some cases probably detracted from, academic integration. These effects and possible reciprocity should be explored in further study.

Exploration of a reciprocal relationship between later goal commitment and later institutional commitment did not prove as fruitful. The addition of a path from goal to institutional commitment resulted in a poorer model. A path measuring

causality in the opposite direction did not significantly improve the model. A simple correlation specified between the two variables was adequate to describe the relationship.

Following the tests of reciprocal causation, modifications to the model were used to test extraneous paths which had been added to the model as the result of previous research (Chapman & Pascarella, 1983; Pascarella et al., 1983; Stage & Richardson, 1985). Comparison of these modifications of the model to the original model through hypothesis testing demonstrated that all but one of these paths did not add significantly to the fit of the model. The single exception was the addition of a path from initial goal commitment to later institutional commitment. The addition of this path significantly improved the fit of the model. However, the t-test for the resulting path coefficient for both of the subgroups indicated that the influence was not significantly different from zero.

In other words, the addition of paths specifying relationships between initial goal commitment and social integration, between initial goal commitment and later institutional commitment, between initial institutional commitment and academic integration, between academic integration and later institutional commitment and between social integration and later goal commitment did nothing to improve the explanatory power of the model. The Tinto model as originally specified adequately and elegantly described the attrition process as tested here. The addition of paths which crossed from one

"sphere" of the model to another did nothing to add to the explanatory power of the model.

The difference in these results from previous research could be attributed to the specification of reciprocal causation between academic and social integration. There were covariances between the two spheres of the model which were also found in previous research. Here, however by specifying reciprocal causation such covariance was accounted for in a more parsimonious model, the Tinto model as originally specified.

Unlike previous research findings, academic integration was a better predictor of later goal commitment than was initial goal commitment. It is possible that in this study those students who had the highest levels of commitment to earning an undergraduate degree were most disappointed in the undergraduate experience at the focal institution. The large lecture halls, the use of graduate instructors, and the lack of contact with faculty may have been particularly disappointing to these students. This finding bears further exploration and could be a problem unique to this particular institution given its particularly high dropout rate.

As in previous research, initial level of commitment to the institution was an important predictor of later institutional commitment. For males, social integration was also an important predictor of later institutional commitment.

Previous persistence studies have found background characteristics comparatively unimportant (Bean, 1980; Pascarella

& Terenzini, 1983). It is not surprising then to note that effects of the background characteristics on later constructs within the model on persistence were generally insignificant.

Ethnicity was an exception however. Majority students were more likely to have higher academic integration scores. The positive relationship between male ethnic minority status and social integration, that these students were more socially integrated, at first seemed puzzling. However, Fleming (1985) found that black students (particularly males) in predominantly white institutions began the institutional experience with positive perceptions of the social environment. As their time on campus lengthened, their perceptions of the social environment turned more negative. The fact that this was a relatively short-term study may have had some influence here.

This study focused only on the characteristics and experiences of a random sample of students who were new fall 1984 freshmen at a large research university. The influences of the constructs within the Tinto model have been found to vary according to institutional characteristics (Pascarella & Chapman, 1983). Additionally, experience patterns leading to persistence have been found to differ according to class level. Finally, it is possible that some of the students who left the institution may be stopouts, that is, they may re-enroll in the university in the future. For these reasons, results must be interpreted with caution.

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